ABSTRACT

A field emission device, which among other things may be used within an ultra-high density storage system, is disclosed. The emitter device includes an emitter electrode, an extractor electrode, and a solid-state field controlled emitter that utilizes a Schottky metal-semiconductor junction or barrier. The Schottky metal-semiconductor barrier is formed on the emitter electrode and electrically couples with the extractor electrode such that when an electric potential is placed between the emitter electrode and the extractor electrode, a field emission of electrons is generated from an exposed surface of the semiconductor layer. Further, the Schottky metal may be selected from typical conducting layers such as platinum, gold, silver, or a conductive semiconductor layer that is able to provide a high electron pool at the barrier. The semiconductor layer placed on the Schottky metal is typically very weakly conductive of n-type and has a wide band gap in order to create conditions conducive to creating induced negative electron affinity at applied fields necessary to provide electron emission. One type of wide band-gap material can be selected from titanium dioxide or titanium nitride or other comparable materials.

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